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Migrating from ATV750B/BL PLD to ATF750C/CL

1. Introduction

The ATF750C/CL is a PLD from Atmel® in a 24- or 28-pin package with 24D or T-type flip-flops, and it is an enhanced version of the well-known ATF750B/BL PLD. The ATF750C/CL is reprogrammable using Atmel's proven EEPROM-based technology and is pin-to-pin, functionally, and JEDEC fuse-map wise compatible with the UV EPROM-based ATV750B/BL.

In addition to all the features available in the ATV750B/BL, the ATF750C/CL also has programmable pin-keeper circuits on all of its input and I/O pins, and the ATF750CL has a much lower standby current (approximately 1 mA) than the ATV750BL. Moreover, package options offered for the ATF750C/CL are broader including RoHS compliant (fully Green) packaging and TSSOP package type in addition to the traditional DIP, SOIC, PLCC, and LCC packages. For the ATF750C/CL in the LCC and PLCC package types, there are also more V_{CC} and GND pins available than the ATV750B/BL in the same package types, which could help improve noise immunity of the PLD.

The ATF750C is offered in Commercial, Industrial and Military temperature grades while the ATF750CL is offered in Commercial and Industrial temperature grades. Hence, only the ATF750C is offered in Military temperature grade but not the ATF750CL. The ATF750C in Military temperature grade is also MIL-STD-883 compliant.

With the obsolescence of the ATV750B/BL family of devices, they are to be replaced by the ATF750C/CL devices. This application note will provide details of the ATV750B/BL-to-ATF750C/CL migration.

The datasheet for the ATF750C/CL can be viewed on-line at:

http://www.atmel.com/dyn/resources/prod_documents/doc0776.pdf

2. Cross Reference Tables

Table 2-1 lists the ATV750B/BL devices that are obsolete and the corresponding recommended ATF750C/CL replacements. For commercial and industrial applications, it is recommended to use the ATF750C/CL in fully Green (RoHS) package types even though some leaded packages are still available.

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Application Note

Rev. 3697A–PLD–9/08

Table 2-1. Obsolete Devices and Recommended Replacements

Obsolete Part Number	Replaced with Part Number
ATV750B-7JC	ATF750C-10JU(1)
ATV750B-7PC	ATF750C-10PU(1)
ATV750B-10JC	ATF750C-10JU
ATV750B-10PC	ATF750C-10PU
ATV750B-10SC	ATF750C-10SU
ATV750B-10SI	ATF750C-10SU
ATV750B-10PI	ATF750C-10PU
ATV750B-10JI	ATF750C-10JU
ATV750B-15JC	ATF750C-10JU(1)
ATV750B-15PC	ATF750C-10PU(1)
ATV750B-15SC	ATF750C-10SU(1)
ATV750B-15SI	ATF750C-10SU(1)
ATV750B-15PI	ATF750C-10PU(1)
ATV750B-15JI	ATF750C-10JI(1)
ATV750B-25JC	ATF750C-10JU(1)
ATV750B-25PC	ATF750C-10PU(1)
ATV750B-25SC	ATF750C-10SU(1)
ATV750B-25SI	ATF750C-10SU(1)
ATV750B-25PI	ATF750C-10PU(1)
ATV750B-25JI	ATF750C-10JU(1)
ATV750BL-15JC	ATF750CL-15JU
ATV750BL-15PC	ATF750CL-15PU
ATV750BL-15SC	ATF750CL-15SU
ATV750BL-15SI	ATF750CL-15SU
ATV750BL-15PI	ATF750CL-15PU
ATV750BL-15JI	ATF750CL-15JU
ATV750BL-25JC	ATF750CL-15JU(1)
ATV750BL-25PC	ATF750CL-15PU(1)
ATV750BL-25SC	ATF750CL-15SU(1)
ATV750BL-25SI	ATF750CL-15SU(1)
ATV750BL-25PI	ATF750CL-15PU(1)
ATV750BL-25JI	ATF750CL-15JU(1)
ATV750B-10DM/883 or 5962-8872608LA	ATF750C-10GM/883 or 5962-0720101MLA
ATV750B-10LM/883 or 5962-88726083X	ATF750C-10NM/883 or 5962-0720101M3A
ATV750B-15DM/883 or 5962-88726083X	ATF750C-15GM/883 or 5962-0720102MLA
ATV750B-15LM/883 or 5962-88726093X	ATF750C-15NM/883 or 5962-0720102M3A
ATV750BL-15DM/883 or 5962-8872611LA	ATF750C-15GM/883 or 5962-0720102MLA(2)
ATV750BL-15LM/883 or 5962-88726113X	ATF750C-15NM/883 or 5962-0720102M3A(2)

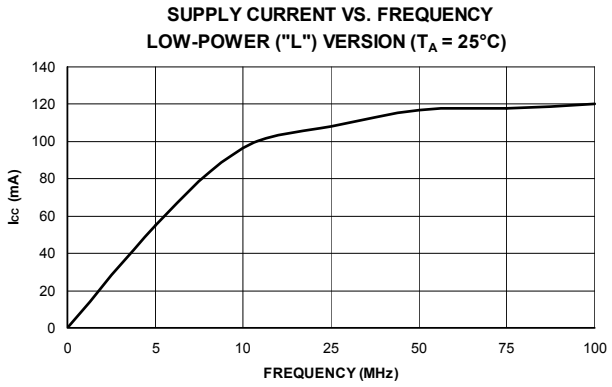
Notes:
1. The speed grade of the recommended replacement device is not the same as the speed grade of the device being replaced.
2. The recommended replacement device is a Standard-Power device while the device being replaced is a Low-Power (L) device.

Atmel strongly recommends customers who are using the ATV750BL-15DM/883 or ATV750BL-15LM/883 devices to replace them with the ATF750C-15GM/883 or ATF750C-15NM/883, respectively, if lower power consumption is not an important consideration for their application since the ATF750CL is not offered in the Military temperature grade. More information is provided in the following section.

3. Power Consumption Considerations

When migrating from the ATV750BL Military temperature grade device to the ATF750C, designers should consider power consumption requirements for their applications. For applications that are using the Low-Power devices (ATV750BL-15DM/883 or ATV750BL-15LM/883), designers must first determine whether the Low-Power feature is required or not when considering the migration to the ATF750C. As shown in the Supply Current vs. Frequency Curve (Figure 3-1), the Low-Power feature only takes effect at operating frequencies below 20 MHz. At frequencies above 20 MHz, the Low-Power feature in the CPLD is effectively disabled and the power consumption of the CPLD will be the same as a Standard-Power device. Hence, the applications will not benefit from the Low-Power feature. Please refer to the ATF750C(L) datasheet on Atmel's website for the latest ICC data.

Figure 3-1. Supply Current vs. Frequency Curve



For Commercial and Industrial applications where the PLD stays idle for long periods of time, migrating from the ATV750BL to ATF750CL will provide more power savings to these systems since the ATF750CL has a much lower ICC (standby) than the ATV750BL (1 mA vs. 30 mA max, and 0.15 mA vs. 15 mA typical). For more information on the Low-Power feature, please refer to the "Saving Power with Atmel PLDs" application note available on-line at:

http://www.atmel.com/dyn/resources/prod_documents/DOC0457.PDF

4. New Features in ATF750C/CL

The following list summarizes the enhanced feature of the ATF750C/CL:

- **Programmable Pin-keeper circuits on input and I/O pins**
- **Very low standby current consumption for the ATF750CL**
- **Additional VCC and GND pins for the PLCC and LCC package types**
- **Electrically erasable**
- **Improved testability**
- **Improved programming yields**

The sections below contain details on these enhanced features.

4.1 Pin-keeper (Programmable Option)

The ATF750C/CL has programmable Pin-keeper circuits on its input and I/O pins but the ATV750B/BL does not. This means that any un-driven input or I/O pin (e.g. unused pin or tri-stated output) on the ATV750B/BL may float between “high” and “Low” logic levels, which can lead to higher power consumption since more current flows during transitions to each level. To prevent input and I/O pins from floating, the Pin-keeper circuits in the ATF750C/CL can be enabled by specifying the appropriate device mnemonic in the CUPL design as described in Table 4-1.

Table 4-1. WinCUPL Device Mnemonic

Device	WinCUPL Device Mnemonic	Pin-keeper
ATF750C/CL-DIP	V750C V750CPPK	Disabled Enabled
ATF750C/CL-PLCC	V750CLCC V750CPPKLCC	Disabled Enabled

When cross-programming an ATV750B/BL JEDEC file into the ATF750C/CL, the Pin-keeper option will be disabled automatically during programming since the ATV750B/BL does not support this feature.

4.2 Low Standby Current

The ATF750CL features a low standby current of 1 mA (max) in Commercial temperature range, compared to 30 mA of the ATV750BL. This can be extremely beneficial in designs where the PLD implements logic functions that operate only for a short time and then stays idle until the next operation is executed (for example, a data acquisition system which takes measurements in certain periods of time and then goes idle).

4.3 Electrically Erasable

The ATF750C/CL is a EEPROM based PLD while the ATV750B/BL is UV EPROM based. Therefore, the ATF750C/CL can be electrically erased but the ATV750B/BL cannot. This gives users the capability to easily erase and re-program the ATF750C/CL using a device programmer.

Furthermore, EEPROM-based PLD allows the part to be better tested with improved programming, quality, and overall yields to customers and hence lower the overall cost.

4.4 Additional VCC and GND Pins

The ATF750C/CL devices in the PLCC and LCC package types have 1 more VCC pin (pin #1) and 3 more GND pins (pin #8, 15, and 22) than the ATV750B/BL in the same package types. These additional power pins can be used to improve the noise immunity of the ATF750C/CL. Connections to these pins are not required but are highly recommended for enhanced noise immunity.

5. Programming (How do I program the ATF750C/CL?)

Cross-programming is the fastest way to port an ATV750B/BL design to the ATF750C/CL. Third-Party Programmer support for ATF750C/CL (including cross-programming capability) is available from major vendors such as Data I/O, BPM Microsystems and HI-LO Systems. Some Third-Party Programmers such as Data I/O [UniSite/3900 models] have a device listing specifically for Atmel cross-programming (ATMEL-XPGM). In simplistic terms, cross-programming implies that existing ATV750B/BL JEDEC fuse-map files can be programmed into the ATF750C/CL without the need to recompile designs specifically for the ATF750C/CL. Table 5-1 lists examples of device menu types that are used by some of the Third-Party programmer vendors.

For example:

> Use device type “TF750C-PLCC as ATV750B-PLCC” to cross-program an ATV750B JEDEC file into an ATF750C in the PLCC package type.

Table 5-1. Cross-programming Device Type Examples

Programmer	Cross-programming Device Type Example
BPM Microsystems	Atmel ATF750C as v750B
Data I/O	750C-PLCC as 750B-PLCC(1)
HI-LO Systems	ATF750C/CL (V750B)

Note: 1. Under the ATMEL-XPGM manufacturer list.

6. Design Tools

Customers who need to recompile their designs to target the ATF750C/CL must use Atmel WinCUPL. This is free to download from the Tools & Software section of the PLD home page at http://www.atmlel.com/products/pld. Customers who are using DOS ABEL or ATMEL SYNARIO (with ABEL 6.x) can continue to target designs to an ATV750B device and then use cross programming to program the ATF750C/CL device.

7. Technical Support

URL: http://www.atmel.com/dyn/products/support.asp

E-mail: pld@atmel.com

Hotline: (408) 436-4333